

WHAT IS CLAIMED IS:

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1. A computer system coupled with a pipelined network comprising:
a plurality of initiator nodes coupled to send packets, into the network;
a plurality of target nodes coupled to receive packets sent into the network;
and
a plurality of pipeline stages for transmitting data across the network, each
pipeline stage consuming a predetermined time period, thereby
providing for a predetermined time period for transmission for each
packet successfully sent between one of the initiator nodes and one of
the target nodes.

2. The computer system as recited in claim 1 wherein the pipelined
network is synchronous in that boundaries of all the pipeline stages are aligned.

3. The computer system as recited in claim 1, wherein the pipeline stages
include an arbitration stage, a transfer stage, an acknowledge stage, the stages being in
a fixed time relation to each other.

4. The computer system as recited in claim 3, the pipeline stages having
equal length.

5. The computer system as recited in claim 3 further comprising a check
stage in which an initiator node checks if transmission of a sent packet was
successful.

6. The computer system as recited in claim 3 further comprising
arbitration logic coupled to the initiator nodes, the pipelined network, and the target
nodes, the initiator nodes supplying requests to the arbitration logic for transmission
of respective packets to respective target nodes during respective arbitration stages,
the arbitration logic responsive to the initiator node requests to schedule packet
transmission across the network.

5/27/17
7. The computer system as recited in claim 6 wherein for a particular transfer, the arbitration logic is coupled to receive an indication from a particular target node for the particular transfer as to whether the particular transfer can be supported in the particular target node.

8. The computer system as recited in claim 3 wherein during the transfer stage the packet supplied by the initiator traverses the network.

9. The computer system as recited in claim 3 wherein during the acknowledge stage, an acknowledge packet is returned by the target node to the initiator node.

10. The computer system as recited in claim 9 wherein the acknowledge packet is checked by the initiator during the check stage.

11. The computer system as recited in claim 10 wherein the check stage is fixed in time in relation to the arbitration stage, thereby allowing the initiator node to check for successful completion of sending the packet a fixed time after the arbitration stage.

12. The computer system as recited in claim 3 wherein the transfer stage includes multiple pipeline stages to transmit the transfer packet across the network.

13. The computer system as recited in claim 3 wherein the acknowledge stage includes multiple stages to transmit the acknowledge packet across the network.

14. The computer system as recited in claim 3 wherein the number of bytes transferred per request during the transfer stage is fixed.

15. The computer system as recited in claim 3 wherein outstanding transactions across the pipelined network are delivered in order.

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Sub A 7
22. The method as recited in claim 19 wherein the pipelined network includes a first switching circuit coupling the initiator node and the target node, the first switching circuit carrying information transmitted during the transfer stage.

23. The method as recited in claim 22 wherein the pipelined network includes a second switching circuit coupling the initiator node and the target node, the second switching circuit being independent of the first switching circuit and wherein information for at least a portion of pipeline operations are carried over the second switching circuit simultaneously with operations for the transfer stage carried over the first switching circuit.

24. The method as recited in claim 23 wherein information for the arbitration and acknowledge stages are carried over the second switching circuit during arbitration and acknowledge pipeline stages, respectively.

25. The method as recited in claim 19 further comprising generating a schedule for traversing the pipeline stages of the network in the arbiter, the schedule determining for each slot on the pipeline, each slot being a length of a pipeline stage, which input port is connected to which output port.

26. A method as recited in claim 19 wherein each initiator node of a plurality of initiator nodes provides a request vector indicating one or more desired target nodes, to the arbitration logic, the request vectors for at least some of the initiator nodes including multiple target nodes and wherein the arbitration logic schedules a future pipeline slot to avoid conflicts, the arbitration logic globally scheduling use of the network.

27. The method as recited in claim 19 further comprising the initiator node checking the acknowledge packet a fixed number of pipeline stages after sending the transfer packet, to determine whether transmission of the information was successful.

28. The method as recited in claim 18 further comprising:

Sub 12-7
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scheduling usage of the network using an arbiter in response to requests from initiator nodes to allocate each stage of the pipeline so as to avoid conflicts for network resources.

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1 29. The method as recited in claim 28 wherein the scheduling includes
2 accounting for prescheduled requests, the prescheduled requests requesting periodic
3 slots on the network.

1 30. The method as recited in claim 18 further comprising sending all
2 information across the network in order.

1 31. A networked computer system comprising:
2 a plurality of processing nodes, each processing node including at least one
3 processor; and
4 a synchronous pipelined switched network coupling the plurality of processing
5 nodes, the pipelined network having a plurality of pipeline stages, the
6 pipeline including at least an arbitration stage to obtain a path through
7 the pipelined switched network, a transfer stage transferring data over
8 the path and an acknowledge stage, each stage being of equal length.

1 32. The networked computer system as recited in claim 31 wherein the
2 pipelined switched network comprises a first switching circuit coupling the plurality
3 of processing nodes, the first switching circuit carrying information transmitted
4 during the transfer stage.

1 33. The networked computer system as recited in claim 32 wherein the
2 pipelined switched network comprises a second switching circuit coupling the
3 processing nodes, the second switching circuit being independent of the first
4 switching circuit and wherein at least a portion of pipeline operations are carried over
5 the second switching circuit simultaneous with operations for the transfer stage
6 carried over the first switching circuit.

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35. The networked computer system as recited in claim 31 wherein the networked computer system further includes at least one storage node coupled to the plurality of processing nodes through the synchronous pipelined switched network.

DESIGNING FOR THE FUTURE